

## ***Interactive comment on “Performance assessment of a triple-frequency spaceborne cloud–precipitation radar concept using a global cloud-resolving model” by J. Leinonen et al.***

**Anonymous Referee #3**

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This paper assesses the effectiveness of triple-frequency precipitation detection at two orbital heights using a CRM. The manuscript provides a unique perspective of radar simulations in a global context by utilizing a consistent model framework for the different precipitation regimes examined. The authors' cutting-edge global CRM application to the comparison of future satellites provides direct and informed conclusions. The paper is well written and the methods employed are sound. Some minor revisions are suggested:

There are a few parts of Section 1 that may need an additional citation or two. Pg. 4140 L25 as an example, “Prior studies...”. Pg 4140 L5 should explicitly state the 2007

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NASA decadal survey.

The authors should clarify the difference between the simulated retrievals and what the ACE satellite may actually see, beyond the explanation in Section 5.1. The authors make rigorous estimates for NUBF and multiple scattering, but neglect the effects of surface contamination for all regional cross sections. Right now the cross sections assume visibility to the surface, while the global analysis uses reflectivities only down to 400 m. It could be mentioned in subsections of Section 5 when surface contamination may have a nontrivial effect on the results, like the maritime stratocumulus and midlatitude front cases.

To motivate the impetus of the ACE mission alluded to, it may be helpful to revisit Figure 1 at the MDR limitations of current missions, namely GPM and CloudSat. This will highlight the improvement in precipitation sensing that the ACE mission affords due to its improved sensitivity in either orbital height.

Figures 7-17 (odd only) seem repetitive at times, and the differing x scales in each case make them difficult to compare on the fly. Tables could collapse the information into an easier to read and more compact form.

Other technical corrections:

1. e.g. page 4140, L25: “cloud resolving”. To be consistent with the title, consider hyphenating “cloud resolving”'s appearances.
2. Page 4143, Eq (2): no LHS. Consider defining as  $Z =$ .
3. Page 4146, Eq (6): b in next to last term in equation. Should be  $\beta$ .
4. Pages 4150 and 4151: it would be great to rearrange the phrase “dry snow, melting snow, and raindrops” and the respective terms in a consistent order in Eq (23) and Eq (25).

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5. Page 4152, L19: "effets". Should be effects.
6. Page 4163, L28: "heavier NUBF". Better adjective?.
7. Fig 14(d): could use a title describing it as a vertical cross section

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